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Turnover Plan for the ECS Project

White paper - Not intended for formal review or Government approval.

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Abstract

This White Paper describes the ECS Project's implementation of the ECS Statement of Work (SOW) and the ECS Product Assurance Requirements (PAR) requirements for the post-CDR activities and reviews leading to turnover of the EOSDIS Core System (ECS) to NASA. The document consolidates the ECS Project's current understanding of the turnover process into a single reference document for the convenience of all participants in the ECS turnover process. The post-CDR activities described herein include the product development, integration, test, operational site delivery, and on-site acceptance test activities; and the Readiness Reviews associated with those activities.

This paper was prepared at the request of the GSFC Quality Office and has been reviewed with the sponsor and other members of the ESDIS staff.

Keywords: implementation, development, integration, software, hardware, readiness, review, thread, build, release, test, acceptance, turnover, transition

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1. Introduction

1.1 Purpose

This White Paper describes the ECS Project's implementation of the ECS Statement of Work (SOW) and the ECS Product Assurance Requirements (PAR) requirements for the post-CDR activities and reviews leading to turnover of the EOSDIS Core System (ECS) to NASA. The post-CDR activities described herein include the product development, integration, test, operational site delivery, and on-site acceptance test activities; and the Readiness Reviews associated with those activities. The readiness reviews provide ECS Project management, ESDIS, and the Earth science community insight into the details of the post-CDR delivery and turnover process.

The ECS Project's turnover activities also have been described in a number of Contract Data Requirements List (CDRL) documents that have been delivered as the development of the ECS evolved. This White Paper consolidates the ECS Project's current understanding of the turnover process into a single reference document for the convenience of all participants in the ECS turnover process. It describes a generic framework of activities and reviews for release and turnover of ECS products that can be tailored for all ECS Releases.

1.2 Organization

This paper is organized as follows:

Section 1 provides the Purpose, Organization, Review and Approval procedures for this document.

Section 2 describes parent and applicable documents that are useful in understanding the details of topics discussed in this document.

Section 3 describes the ECS Project's current understanding of the turnover process.

1.3 Review and Approval

This White Paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval. Questions regarding information contained within this Paper should be addressed to the following ECS contacts:

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2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content are derived:

301-CD-002-003	System Implementation Plan for the ECS Project
420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-03	EOSDIS Core System Contract Data Requirements Document

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable.

102-CD-001-004	Development Configuration Management Plan for the ECS Project
194-201-SE1-001	System Engineering Plan for the ECS Project
308-CD-001-006	Software Development Plan for the ECS Project
319-CD-004-003	CSMS Integration and Test Plan for the ECS Project, Volume 2: Release A
319-CD-005-002	SDPS Integration and Test Plan for the ECS Project, Volume 2: Release A
194-401-VE1-002	Verification Plan for the ECS Project
402-CD-002-002	System Integration and Test Plan for the ECS Project, Volume 2: Release A
402-CD-003-001/ 319-CD-006-001	Release B System and Segment Integration and Test Plan
409-CD-001-004	ECS Overall System Acceptance Test Plan for Release A
409-CD-002-001	ECS Overall System Acceptance Test Plan for Release B
194-415-VE1-002	Acceptance Testing Management Plan for the ECS Project
194-501-PA1-001	Performance Assurance Implementation Plan for the ECS Project (PAIP)
194-602-OP1-001	Property Management Plan for the ECS Project

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3. ECS Turnover Process

This section describes the ECS Project's current understanding of the turnover process for ECS Releases

3.1 ECS Turnover Process Overview

The ECS turnover process includes the post-CDR development, integration and test, and acceptance activities; and the associated readiness reviews leading to turnover of the system to NASA. Figure 3-1, ECS Turnover Process, illustrates the principal activities in the process and the review milestones that must be passed before proceeding into the next phase(s) of activities. The Readiness Reviews included in the process allow ECS Project management, ESDIS, and representatives of the Earth science community to review the status of the evolving ECS hardware and software products at key points in order to ensure an acceptable delivered operational system. The reviews are scheduled to coincide with the completion of the principal activities associated with each phase of the turnover process. A primary source of material for each review is the set of documents specified by the Contract Data Requirements List (CDRL) and defined by the Data Item Descriptions (DIDs). These documents govern the turnover process and capture its results. The Data Management Office (DMO) maintains the status of all CDRL documents, and provides this information to the COTR via the monthly Document Delivery Status Report.

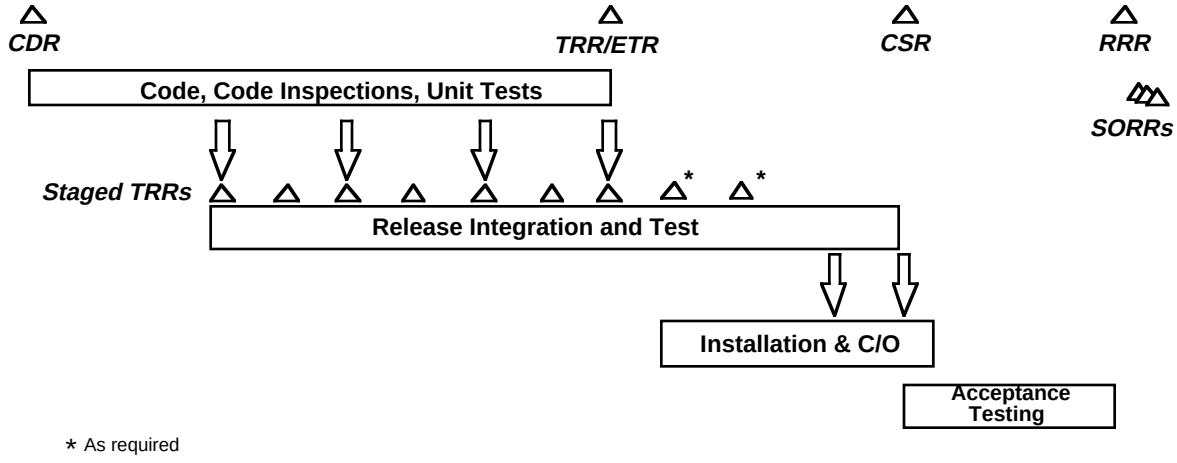

Figure 3-1. ECS Turnover Process

The ECS turnover process consists of three principal phases:

- The Software Development Phase begins after the Critical Design Review (CDR) and ends with the final Staged Test Readiness Review (TRR). Staged TRRs will be described in more detail later in this section.
- The Release Integration and Test (I&T) Phase begins with the first Staged TRR and ends with the Consent to Ship Review (CSR). As described later in this section, the Release I&T Phase overlaps the latter parts of the Software Development Phase.
- The Acceptance Test Phase extends from the CSR through the Release Readiness Review (RRR). It includes the formal installation of developed software at the operational sites, site-specific acceptance testing and the "All-Up" ECS acceptance test. (The System Operational Readiness Review (SORR) occurs after RRR and is described later in this document)

The three phases of the turnover process are described in the following sections of this document. The process can be tailored to meet the needs and objectives of specific Releases.

3.2 Software Development Phase

The ECS Software Development Phase is illustrated in Figure 3-2. It shows the software development activities, the transition to formal configuration management, and the staged TRRs that authorize the release of unit tested software into the Release I&T Phase. For a specific Release, two main development processes may be used; the formal development track and the incremental development track. From a Release I&T point of view, the incremental track can be viewed as a parallel development methodology. Software from the incremental track enters the test process at the Test Readiness Review (TRR) for integration with threads and builds from the formal development track. A thread is defined as the set of components (software CIs, hardware and data) and operational procedures that implement a function or set of related functions. A build is an assemblage of threads to produce a gradual buildup of segment capabilities.

After TRR, the incremental development track has rejoined the formal development track and is indistinguishable from formally developed software. Additional details on formal track and incremental track development can be found in the Systems Engineering Plan for the ECS (194-201-SE1-001).

Figure 3-2 also identifies the principal documents used to implement the various activities, and the information and documents that form the basis for the Staged TRRs. The initial portion of the Release I&T Phase (Figure 3-3) is replicated in Figure 3-2 to illustrate the relationships between the Software Development Phase and the Release I&T Phase.

3.2.1 Software Development

The software development activities described in the succeeding sections include software coding, peer inspections and unit testing.

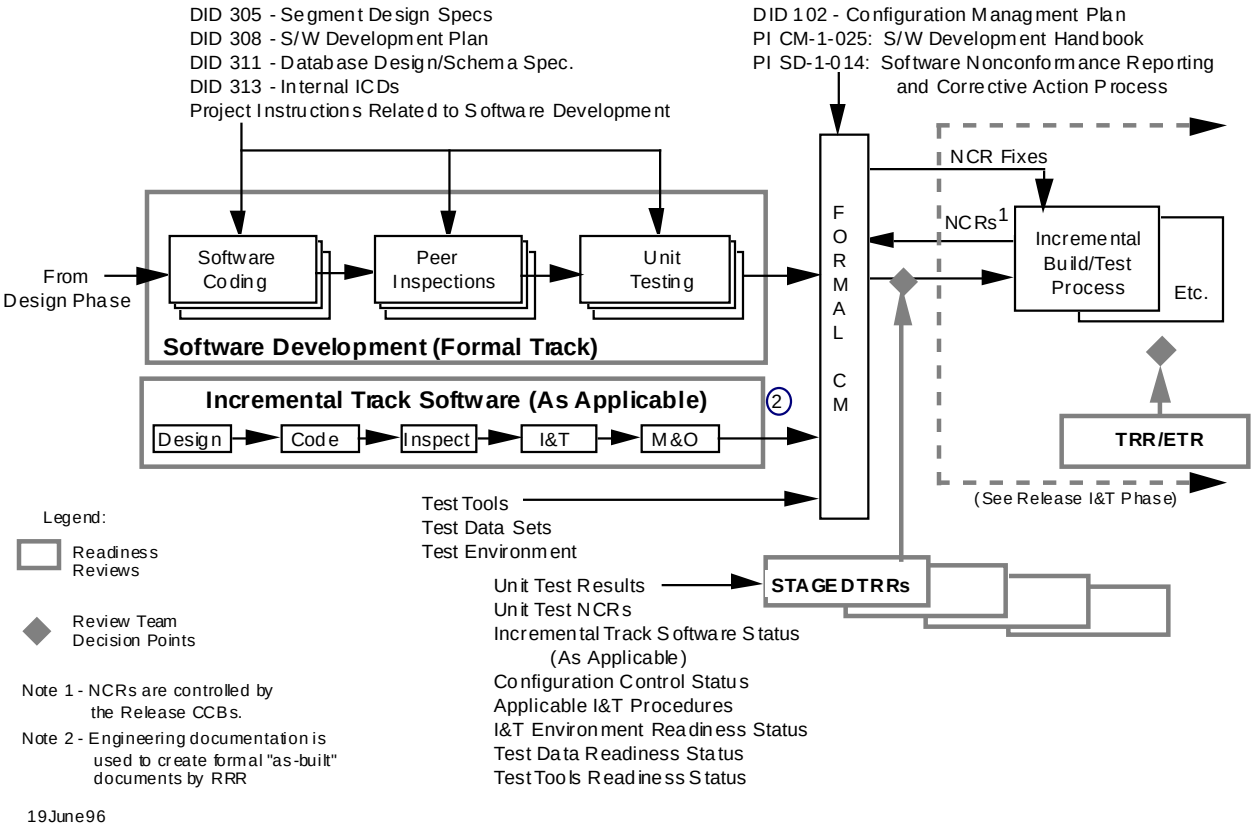

Figure 3-2. Software Development Phase

3.2.1.1 Software Coding

Software coding is conducted in the ECS Development Facility (EDF) in accordance with DID 308, Software Development Plan. The code is developed in compliance with the applicable design and Interface Control Documents (ICDs):

DID 305	Segment Design Specifications
DID 311	Data Base Design and Schema
DID 313	Internal ICDs

During software coding, Computer Software Units (CSUs) are coded, debugged, and a clean compilation produced. The Software Development Files (SDFs) corresponding to these CSUs are updated. The CSU source code is maintained in the Software Development Library (SDL) using the ClearCase tool during software coding and subsequent turnover activities.

Additional details on the software coding process can be found in the following ECS Project Instructions (PIs):

PI CM-1-025	Software Development Handbook. The Software Development Handbook brings together in one manual the Configuration Management (CM) procedures necessary to develop, test, control and release software.
PI SD-1-005	Software Development Files. This PI describes the contents of a software development file (SDF), and the procedure for maintaining it. The SDF is an evolving entity that contains historical information representing the current state of a software unit in an auditable form. A SDF is created for each Computer Software Unit (CSU) by the responsible engineer before detailed design on the CSU begins.
PI SD-1-006	Common Software Development. Common Software is defined as that software that is reused across development groups, CSUs, CSCs or CSCIs. This PI is used if it is applicable.
PI SD-1-007	Coding Standards for FORTRAN
PI SD-1-008	Coding Standards for Ada
PI SD-1-009	Coding Standards for C
PI SD-1-010	Coding Standards for C++
	Note: As the names suggest, the coding standards PIs specify programming practices, styles and conventions to be followed while coding in the respective languages.
PI SD-1-012	Heritage Software. This PI defines the guidelines for accepting and integrating any existing software. It is used if applicable.
PI SD-1-013	COTS Process Model. This PI describes the process by which COTS software products are identified, procured and maintained. It is used if applicable.
PI SD-1-015	Software Naming Conventions. This PI describes how source files, header files and library files are named.

3.2.1.2 Software Peer Inspection

Software peer inspections are conducted to ensure that the code, unit test plans and unit test procedures implement allocated requirements and comply with project standards. Software peer inspections are described in detail in PI SD-1-004, Software Inspection Process. The software peer inspection reports are placed into the respective SDFs.

3.2.1.3 Unit Testing

As each CSU's coding is completed, the CSU is tested to ensure that its allocated requirements are satisfied. The software developer responsible for the CSU develops a set of step-by-step test procedures to verify that the applicable requirements have been satisfied. The unit test procedures are reviewed by the QO and developers as part of the software peer inspections described above. The software developer conducts the unit tests to verify the functionality of the unit and the contents of the test procedures. QO monitors and witnesses a random sample of unit tests to ensure that the test procedures are being followed. The results of unit testing are placed into the respective SDFs.

The software developer(s) prepare the Software Turnover Form (STF) for turnover of the software to the Configuration Management Office (CMO). CMO takes physical control of the software as described in the next section and produces software builds for turnover to integration and test (I&T). The Software Development Handbook (PI CM-1-025) contains additional details on turnover of software to CMO.

3.2.2 Configuration Management

CMO is responsible for maintaining file structures in the SDL for use by the software developers. Those files remain under the control of the applicable software development organization until a thread has completed unit testing and is ready for Release integration and test (I&T). At that time the thread becomes part of the ECS formal baseline under the physical control of CMO. This means that software is placed in controlled access files and changes can be made by the developers only by prior approval of a Configuration Control Board (CCB), or other designated board.

The Release CCB or, as applicable, the FOS CCB, controls Class II changes to the Release baseline. The ECS CCB and the ESDIS CCB control Class I changes as described in the Development Configuration Management Plan (102-CD-001-004).

3.2.3 Nonconformance Reporting

Nonconformance reporting encompasses a wide range of activities including observing, reporting, recording, assessing, analyzing, correcting and verifying nonconformance issues. Until the software for a CSU is turned over to CMO, nonconformance reporting and corrective action are the responsibility of the developers. After the software is turned over to the CMO, nonconformance reporting is formal and done in accordance with PI SD-1-014, Nonconformance Reporting. Nonconformances that remain in the software when it is turned over to the CMO are formally filed as Non Conformance Reports (NCRs) and entered into the Nonconformance Reporting and Corrective Action (NRCA) system.

3.2.4 Staged Test Readiness Reviews

A “Staged” (or “Mini”) Test Readiness Review (TRR) is held for each set of integration tests for each Release. Each TRR is conducted after the components for the integration test have been built, the test procedures have been written and the components have been prepared for testing.

The TRRs involve reviews of the documentation and results of unit testing to ensure that the software and hardware components are ready for integration testing. The objective of each TRR is to:

- Determine that the applicable integration test procedures are complete
- Ensure that the Project is prepared for integration level testing
- Evaluate integration test procedures for compliance with test plans

Attendance at TRRs typically includes the subsystem development organization, the I&T organization(s), and representatives from CMO, QO, and ESDIS. The format of the TRR is designed to provide an understanding of the readiness for test, and constructive feedback into the verification process. Roundtable discussion is encouraged and action items and recommendations are captured for later resolution. The following is an example of the items typically included in the TRR Checklist:

Software Readiness

- Unit test results
- Unit test Nonconformance Reports (NCRs) status
- Incremental track software status (as applicable)
- CMO control of software

Applicable I&T Procedures

- Requirements mapping

I&T environment

- I&T environment/test configuration readiness
- I&T test data/tools readiness

3.2.5 Formal TRR

A formal TRR is convened when the last software components are ready for delivery from the software development organization to the Release I&T organization(s). The formal TRR is held in conjunction with the Element Test Review (ETR) described later in this document. The purpose of the formal TRR is to review the status of the entire Release software package and to assesses readiness to complete the Release I&T activities. Additional details on Staged TRRs and the formal TRR can be found in PI SD-1-020, Test Readiness Reviews.

Problems detected during Staged TRRs and the formal TRR are documented using formal NCRs which are submitted to the Release CCB (or designated review board) for disposition. If the CCB determines that modifications are necessary, the source code is returned to the software developers for correction. Detailed procedures for resolving nonconformance issues are provided in PI SD-1-014, Software Nonconformance Reporting.

3.3 Release Integration and Test Phase

Release I&T consists of the incremental integration of software threads into multiple threads and builds for an ECS Release. The process is illustrated in Figure 3-3, Release I&T Phase, and described in the following sections:

3.3.1 Incremental Build and Test Process

Following each Staged TRR, the Release I&T organization(s) incrementally assembles lower-level functionality into progressively higher levels until the Release is completely integrated and tested. This orderly progression of combining lower level software and/or hardware items to form higher level items with broader capability is the basis of the Release I&T process. Earlier threads and builds focus on demonstration of selected segment functionality. The integration focuses on integrating functionally related components rather than on the structural decomposition achieved through the design process. As such, components from multiple Configuration Items (CIs) or segments may be integrated and tested early in the integration process. Later integration activities demonstrate end-to-end Release level functionality and verify primarily Level 3 requirements. The final build test consists of end-to-end activities that, while still functionally oriented, are similar in context to actual operational scenarios. Discrepancies observed during I&T are formally filed as NCRs and dispositioned as described later in this section.

The I&T process is conducted incrementally in accordance with draft red-lined I&T Procedures applicable to each increment. The red-lined I&T Procedures are merged to produce the preliminary version of the I&T Procedures (DID 322/414) for review at the TRR/ETR. As incremental integration and testing proceed, larger portions of the Release are assembled. The I&T Procedures are corrected during the later phases of I&T and then delivered as final documents prior to the Release Readiness Review (RRR).

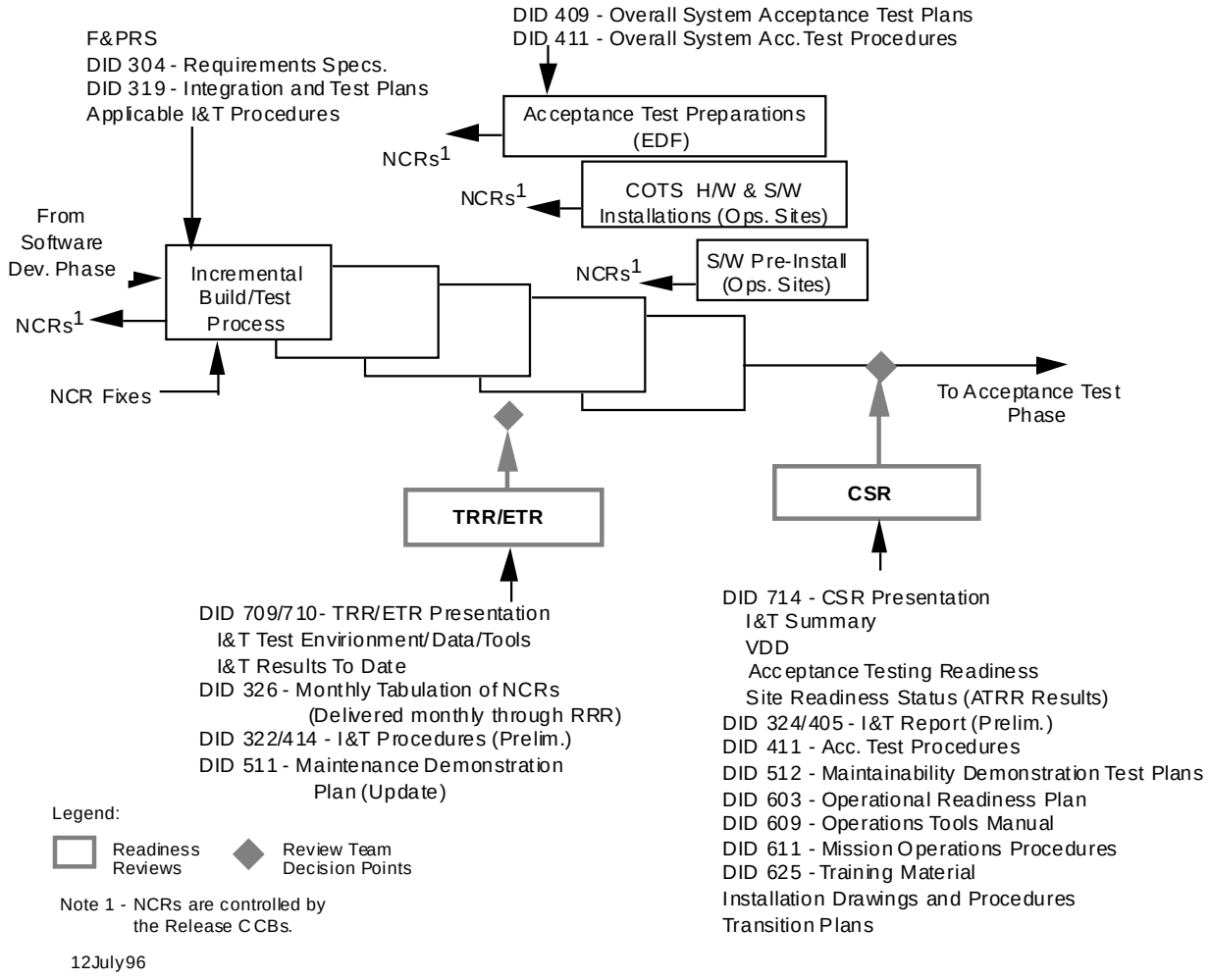

Figure 3-3. Release I&T Phase

3.3.2 Element Test Review

A combined formal TRR (as described earlier) and Element Test Review (ETR) is convened when the last thread is ready for delivery from the software development organization to the Release I&T organization(s). The formal TRR /ETR includes reviews of the entire Release software package, the preliminary Release I&T Procedures (DID 322/414); and it reviews readiness to finish Release I&T activities, including an assessment of the Release I&T environment, the test configuration, test data, and test tools.

The formal TRR/ETR is conducted by the applicable I&T organization(s) and presented to an ESDIS review team. The following are the items typically reviewed at a formal TRR/ETR:

DID 709/710 - TRR/ETR Presentation

- Release I&T environment
  - Environment/test configuration readiness
  - Test data/test tools readiness

DID 326 - Monthly Tabulation of Nonconformance Reports
(Delivered monthly beginning at TRR/ETR and continuing through RRR)

DID 322/414 - I&T Procedures (preliminary)

- Requirements mapping/adequacy of testing

3.3.3 Acceptance Test Preparation

The initial activities of acceptance test preparation are conducted at the ECS Development Facility (EDF). First, an inventory of the resources needed to perform acceptance tests is taken. Items inventoried include test input data, automated test tools, and technical documentation. If any required items are found to be missing or insufficient for acceptance test performance, corrective action is taken. Prior to CSR, walk-throughs of the entire Acceptance Test Procedure (DID 411) are conducted at the EDF to ensure proper format, contents, and completeness of the test scenarios and test plan. Additionally, concurrent with the execution of I&T, critical acceptance test sequences and test cases are executed by IATO against the I&T baseline to ensure that any major problems with either the Release, or the Acceptance Test Procedures and resources, are found at the EDF where they can be most easily corrected. Differences in the test environments between the EDF and the DAAC(s) are considered by the IATO to account for potential differences in expected test results.

Discrepancies observed during acceptance test preparations are formally filed as NCRs and dispositioned as described later in this section.

3.3.4 COTS Hardware and Software Installations

This section describes the process for installing ECS COTS hardware and software.

3.3.4.1 COTS H/W and S/W Installation Planning

After CDR, detailed COTS hardware and software installation planning begins with internal planning involving the installation staff, on-site NASA and site personnel, and the ECS developers. Installation plans developed for each site include:

- The detailed site installation tasks, roles/responsibilities, and schedule
- Bill of materials and equipment/software delivery dates

- Facility drawings of the to-be-installed configuration
- Site-specific installation requirements
- Site preparation requirements
- Plans/procedures for shipping/receiving, property management, local communications support, personnel access and administrative support, library/ publications support

These plans are coordinated with the ESDIS Project Office, the DAAC Managers, and ECS site personnel to ensure schedules are compatible and that required GFE interfaces are provided. Final site installation plans are delivered to the applicable DAAC Managers 30 days before installation to ensure that:

- facility preparation will be completed by the scheduled installation date,
- installation responsibilities are assigned,
- schedule or resource conflicts are resolved, and
- necessary coordination with site personnel has been completed

The site installation plans are provided to the installation teams for final planning, coordination, and execution.

3.3.4.2 COTS H/W and S/W Site Installations

The majority of ECS equipment is staged at the contractor's facility prior to being shipped to the sites. During staging, the equipment and software is inspected, inventoried and tagged, assembled, burned in and tested, and configured to ECS specifications. Staging ensures the equipment and software are of the correct model/version, operational and properly configured at the time it arrives at the site. Its receipt is recorded and reported to the ECS property administrator to establish property accountability and to prepare it for shipment to the site. Large or complex hardware (e.g. robotics archive systems) may be shipped by the vendor directly to the site and installed by vendor personnel. These shipments are coordinated by the ECS property administrator with the vendor to ensure their timely arrival. Additional information about the property management process, including plans for property receiving inspection, identification, movement, storage and disposition can be found in the Property Management Plan (194-602-OP1-001).

An ECS installation team installs COTS hardware and system software, and performs tests to ensure it has been properly installed, configured, and is fully operational. Upon completion of the COTS installation, the team leader verifies that the COTS HW and SW are correctly installed, operational, and ready for installation of ECS applications software. The team leader provides a detailed listing of the equipment and software installed and will obtain the signature of the site's ECS liaison verifying receipt.

3.3.5 Software Pre-Install

ECS software pre-installation is performed at the applicable operational sites prior to CSR. The software used is a snapshot of the ECS system undergoing final system integration at the EDF. The pre-install serves as a pathfinder for the installation of the formal delivery occurring after CSR**.** The software pre-installation is performed by the Release development organization supported by CMO and the M&O organization. A critical function of the pre-install is to perform the DAAC-specific configuration of the ECS such as verifying network addressing, enabling DAAC-unique functions (if any) and tailoring COTS configuration files. Various System Integration and Acceptance test fragments are utilized to characterize the success of the pre-install.

Discrepancies observed during the software pre-install are formally filed as NCRs and dispositioned as described later in this section. Changes to site-specific configuration files formulated as a result of pre-install are forwarded to the EDF for incorporation into the formal baseline in order to facilitate the formal software installation.

The formal installation of the Release is accomplished at the sites immediately following CSR to support formal acceptance testing.

3.3.6 Configuration Management

The Configuration Management Office (CMO) maintains the SDL during the I&T Phase. The I&T software remains under CMO's physical control as described in the section on software development. The Release CCB or, as applicable the FOS CCB, controls Class II changes to the Release baseline. The ECS CCB and the ESDIS CCB control Class I changes as described in the Development Configuration Management Plan (102-CD-001-004). The EDF CCB controls the EDF"s Release test environment.

3.3.7 Nonconformance Reporting

Discrepancies observed during the I&T Phase are formally filed as NCRs and entered into the NRCA system for disposition by the Release CCB (or designated review board). Detailed procedures for resolving nonconformances are provided in PI SD-1-014, Software Nonconformance Reporting. If the CCB determines that modifications are necessary, the software is returned to the developers for correction. After the NCRs are successfully dispositioned and test criteria have been met, the results are reported at the CSR. At the completion of a successful CSR, the Release is declared ready for shipment to the operational sites for formal installation and acceptance testing.

3.3.8 Consent to Ship Review

A Consent to Ship Review (CSR) is held at the completion of the Release I&T Phase. The CSR is a formal review presented to an ESDIS review team. It serves two purposes. First, it determines if I&T has been completed successfully; second, it determines whether the formal site installations and acceptance testing may begin. The objectives of the CSR are to:

a. Review the results of I&T activities at the EDF.

b. Review the approach for installation and test of the Release at the operational sites to ensure that disruptions to ongoing operational services are minimal or nonexistent.

c. Review the status of acceptance test procedures.

d. Determine the readiness of the equipment and staff at the operational sites for Release installation and to support acceptance testing.

The applicable Release development organization is responsible for coordinating and preparing the CSR Presentation (DID 714). The CSR Presentation includes, but is not limited to, the following:

- I&T Results - The outcome of the I&T activities is presented based on a quick-look analysis of test data and the preliminary I&T Report (DID 324/405).
- Deviations from Test Procedures - If any deviations from the printed procedures were necessary during the I&T activities, they are explained and discussed to establish that they did not invalidate the test execution.
- Acceptance Test Preparations results
- Software Pre-installation results
- Configuration Management status - CMO reports on the status of the Version Description Document (VDD)
- Operational Sites' Readiness for deliveries/installations - In preparation for each CSR, the Project's Maintenance and Operations (M&O) organization assesses the status and readiness of each applicable site's COTS hardware and software environment.
- IATO's Readiness for Acceptance Testing
- Nonconformance Report (NCR) Status - The status of all open NCRs is presented along with recommendations for their disposition.
- Installation Plans, including an overview of the applicable installation drawings and Procedures
- Transition Plans

In addition, as specified in the CDRD, the following CDRL documents are delivered in the CSR time frame:

DID 324/405	I&T Report (Preliminary)
DID 411	Acceptance Test Procedures
DID 512	Maintainability Demonstration Test Plans
DID 603	Operational Readiness Plan
DID 609	Operations Tools Manual

DID 611 Mission Operations Procedures

DID 625 Training Material

Based on a successful CSR Presentation and the delivered CDRL documents, ESDIS makes the formal decision to ship the Release.

3.4 Acceptance Test Phase

The acceptance test phase is illustrated in Figure 3-4, Acceptance Test Phase, and described in the following sections.

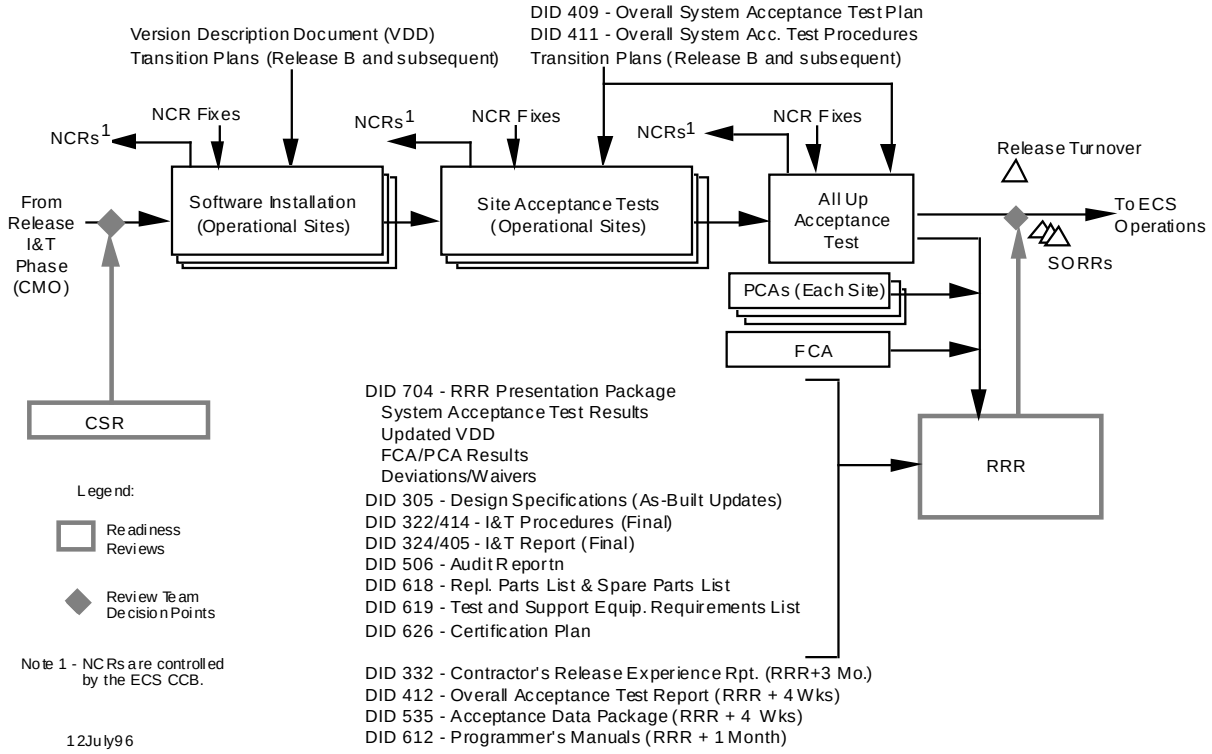

Figure 3-4. Acceptance Test Phase

3.4.1 Software Installation

Following a successful CSR, the final version of the custom software that was used for the Release I&T phase is formally installed at the applicable operational sites. The formal installation replaces the pre-installation described in the Release I&T section. It includes, as applicable; executables, load modules, test data sets, test tools, and documentation. The formal installation at the operational sites is performed by the Release development organization supported by CMO and the M&O organization.

Prior to the execution of test scenarios at the test sites, three final checks are performed. The first check consists of a survey of the operational sites where the Release is to be tested. This pre-test site check is to provide confidence that each operational site is properly configured for formal acceptance testing (See the section on COTS Hardware and Software Installations). The next pre-test check consists of performing a selected set of test cases from the previous Release (as applicable) to ensure that existing operations at the site are not adversely affected by the installation of the new Release. The final check consists of a walk-through of the entire set of acceptance test procedures to ensure site compatibility for the Release. In the event that any discrepancies are observed during these three checks, the discrepancies are formally filed as NCRs in the NRCA system.

When the final checks have been successfully executed the actual execution of test scenarios is coordinated with the Site Manager by the IATO Test Manager.

3.4.2 Acceptance Testing

Acceptance tests are conducted under the direction of an IATO Test Manager. The Test Manager's authority includes the assignment of priority to NCRs, and determination of their impact on ongoing testing. This authority may be delegated by the IATO Test Manager to Test Conductors at specific times (off-shifts) and/or sites or during his or her absence.

Two phases of acceptance testing are executed at specified sites. These phases are: site-specific testing, where the focus is on each individual site; and "all up" testing, where the sites and elements are tested simultaneously as a system. In each case, the final scenario to be executed is an acceptance test demonstration, which exercises a comprehensive sequence of events verifying the overall site-specific and ECS-wide capabilities of the Release. The sites that are tested for a given Release are defined by the test schedules associated with a given Release in the ATP for that Release. Details concerning the test environment and procedures to be followed at test sites involved in a Release acceptance test are described in the Acceptance Test Procedures (DID 411).

As the acceptance testing proceeds from site to site, discrepancies may be uncovered which were not observed during tests at previous sites. If the mitigation of these discrepancies requires the generation of a new Release version, retesting of the new version at each site is the first order of business during the all-up ECS acceptance test.

3.4.3 Configuration Management

The Configuration Management Office (CMO) maintains the Release Baseline in the EDF"s SDL during the Acceptance Test Phase. The delivered software at each site is under the physical control of CMO in each site's SDL. The ECS CCB controls all changes to the Release baseline during acceptance testing.

3.4.4 Nonconformance Reporting

Discrepancies observed during the Acceptance Test Phase are formally filed as NCRs and entered into the NRCA system for disposition by the ECS CCB (or designated review board). Detailed procedures for resolving nonconformances are provided in PI SD-1-014, Software Nonconformance Reporting. If the ECS CCB determines that modifications are necessary, the software is returned to the developers for correction. After the NCRs are corrected and test criteria have been met, the results are reported to the ECS CCB. The ECS CCB authorizes or rejects delivery of the software fixes to the operational sites.

3.4.5 Physical Configuration Audits

The objective of the Physical Configuration Audits (PCAs) is to verify at each operational site that the "as-built" Release conforms to its design documentation. Each PCA includes an audit of engineering drawings, specifications, and technical data for hardware; and an audit of design documentation, listings, and manuals for software. The PCAs are conducted by an ECS Project team led by CMO and, at their option, witnessed by the Project QO and ESDIS. The results are presented at the Release Readiness Review (RRR) and documented in DID 506, Audit Reports (RRR + 4 weeks). Approval of the PCAs by ESDIS establishes the formal Product Baseline for each Release.

3.4.6 Functional Configuration Audit

The objective of the Functional Configuration Audit (FCA) is to verify that the Release's actual performance complies with its requirements and interface specifications. FCAs for ECS Releases are satisfied by an inspection of the Acceptance Test results conducted by an ECS Project team led by the ECS Project Quality Office (QO) and, at their option, witnessed by ESDIS. The results are presented at the Release Readiness Review (RRR) and documented in DID 506, Audit Reports (RRR + 4 weeks).

3.4.7 Release Readiness Review

A Release Readiness Review (RRR) is held at the completion of the Acceptance Test Phase to determine if the Release is ready for transition to IV&V and Operations. The RRR is a formal review presented to an ESDIS review team. The IATO is responsible for coordinating and preparing the RRR Presentation (DID 704). The RRR Presentation includes, but is not limited to, the following:

- Site Acceptance Test Results - The outcome of the acceptance test activities at each site is presented based on a quick-look analysis of test data.
- All-up Acceptance Test Results - The outcome of the all-up acceptance test activities is presented based on a quick-look analysis of test data (DID 412 - Overall Acceptance Test Report is delivered at not RRR + 4 weeks).
- Configuration Management status - CMO reports on the status of the Version Description Document (VDD).

- Nonconformance Report (NCR) Status - The status of all open NCRs is presented along with recommendations for their disposition.
- Deviations/Waivers - Any deviations or waivers required before the Release proceeds to IV&V and Operations are presented.

In addition, as specified in the CDRD, the following CDRL documents are delivered in the RRR time frame:

DID 305	-	Design Specifications (As-built updates)
DID 322/414	-	I&T Procedures (Final)
DID 324/405	-	I&T Report (Final)
DID 332	-	Contractor's Release Experience Report
DID 412	-	Overall Acceptance Test Report (RRR + 4 weeks)
DID 506	-	Audit Reports (Results of FCA/PCAs)
DID 535	-	Acceptance Data Package (RRR + 4 weeks)
DID 612	-	Programmer's Manuals (RRR + one month)
DID 618	-	Replacement Parts List and Spare Parts List
DID 619	-	Test and Support Equipment Requirements List
DID 626	-	Certification Plan

Based on the RRR Presentation and the delivered CDRL documents, ESDIS makes the formal decision to proceed or not proceed to IV&V and operations.

The DD 250, “Material Inspection and Receiving Report,” required by Contract Clause F.2, “Shipping Instructions,” is prepared for each Release after the Release Readiness Review (RRR).

3.5 System Operational Readiness Review

System Operational Readiness Reviews (SORRs) are conducted at the government's option after RRR to review the readiness of other elements of the Earth Observing System (EOS) or its interfacing systems. SORRs are supported as necessary by the ECS Project.

Abbreviations and Acronyms

CCB	Change Control Board
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CI	Configuration Item
CMO	Configuration Management Office
COTR	Contracting Officer's Technical Representative
COTS	Commercial off the shelf
CSU	Computer Software Unit
DAAC	Distributed Active Archive Center
DID	Data Item Description
DMO	Data Management Office
ECS	EOSDIS Core System
EDF	ECS Development Facility
EOC	EOS Operations Center
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System (GSFC Code 505)
ETR	Element Test Review
FCA	Functional Configuration Audit
FOS	Flight Operations Segment
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
I&T	Integration and Test
IATO	Independent Acceptance Test Organization
ICD	Interface Control Document
IV&V	Independent Verification and Validation
M&O	Maintenance and Operations

NASA	National Aeronautics and Space Administration
NCR	Nonconformance Report
PAR	Performance Assurance Requirements
PCA	Physical Configuration Audit
QO	Quality Office
RRR	Release Readiness Review
RTM	Requirements and Traceability Management
SDF	Software Development File
SDL	Software Development Library
SDPS	Science Data Processing Segment
SMC	system monitoring and coordination center
SORR	System Operational Readiness Review
SOW	Statement of Work
STF	Software Turnover Form
TRR	Test Readiness Review